**SPECIFIC GRAVITY BY DENSITY BOTTLE**

AIM OF THE EXPERIMENT:-

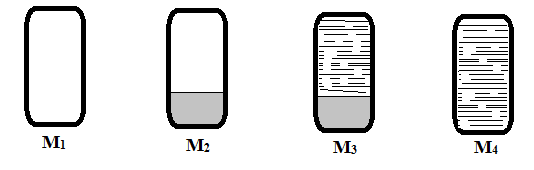
To determine the Specific Gravity of soil a particle passing through 4.75 mm IS sieve using Density bottle.

APPARATUS REQUIRED:-

1. Density bottle of 100 mm capacity.
2. Desiccators.
3. Balance with sensitivity of 0.01 gm.

THEORY:-

Specific Gravity is the ratio of the mass in air of given volume of dry soil solids to the mass of equal volume of distilled water at 4 o C. Or ratio of unit weight of soil solids to that of water. Let, in the figure



M1 = Mass of empty density bottle.

M2 = Mass of density bottle + Soil grains.

M3 = Mass of empty density bottle + Soil grains + water.

M4 = Mass of empty density bottle + water.

The value of specific gravity depends on the temperature hence its value is reported as standard temperature of 27 o C.

G (at 27 o C) = G (at t o C) \* (SG of water at t o C / SG of water at 27 o C)

APPLICATION:

Specific gravity of the soil grains is an important property and is used to determine the voids ratio, porosity, and degree of saturation if density and water content are known.

Its value helps to some extent in identification and classification of solids. It gives an idea about the stability of soil as a construction material; higher value of specific gravity gives more strength for roads and foundation. It is used in comparing the soil particle size by means of hydrometer analysis. It is also used in estimation of critical hydraulic gradient in soil when sand boiling condition is being studied and in zero air void calculation in the compaction theory of solids.

Its value ranges as fallows:

1. Coarse grained soils: 2.6 to 2.7
2. Fine grained soil: 2.7 to 2.8
3. Organic soil: 2.3 to 2.5

PROCEDURE:

1. Take the Weight of clean and dry density bottle.
2. Keep about 10 – 15 gm of oven dried cool soil in bottle and weight (M2).
3. Cover the soil with air free distilled water from the plastic wash bottle. Give some time of socking. A gentle heating may be required to dispel any air inside the soil. Gently stir the soil in the density bottle by clean glass rod. Observed the temperature of the contents (o C) in the bottle and record. Insert the stopper in the density bottle, wipe and weight (M3)
4. Empty the content of bottle, rinse thoroughly, fill it with distilled water at the same temperature, insert the stopper, wipe dry from outside and weight it (M4).
5. Note the ridings as given in Table and at least three such observation and Calculate the Specific Gravity using stated equation.

PRECAUTIONS:

1. The soil grains whose specific gravity is to be determined should be completely dry.
2. Inaccuracies in weighting and failure to eliminate the entrapped air are the main source of error. Both should be avoided by careful working.
3. If pycnometer is used, the cap of the pycnometer should be screwed up to the same mark for each test.

OBSERVATION AND CALCULATION TABLE:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sr.  No. | M1  (Mass of empty density bottle.) | M2  (Mass of density bottle + Soil grains) | M3  (Mass of empty density bottle + Soil grains + water) | M4  (Mass of empty density bottle + water.) | Specific Gravity  G | Avg  G |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |

QUESTIONNAIRE:

1. What are normal range of specific gravity for gravel, sand, silt, clay and organic solids?
2. What is effect of temperature on specific gravity?
3. Can you used any other liquid of instate of water in this test? If Yes, name the liquid.
4. During the test if air is not completely removed. What is the effect on the value of specific gravity?
5. What are the other methods to determine the specific gravity of soil grains?

REFERENCE:-

1. IS : 2720 (Part II) – 1973, Method of Test for soil : Part II
2. Soil Mechanics and Foundations.

TEST PROCEDURE:

1. Select the size of density bottle.
2. Empty bottle is appearing on the screen, and note the mass (M1).
3. Select the type and mass of soil.
4. Bottle with some amount of soil with close lead will appear on the screen and note the mass (M2).
5. Click arrow, some amount of water is added in the bottle and wait for some time (till the soil is completely saturated) mostly around 30 min to 2 hr.
6. Then add again water in bottle till the bottle is full and give some stare for removing the air from bottle and close the lead.
7. Bottle with some soil and full of water is appearing on the screen and note the mass (M3).
8. Click arrow, Empty the bottle and fill completely with distal water and note the mass (M4).
9. Then run the experiment specific gravity of soil will appear.